

Section 3

Drainage System Description

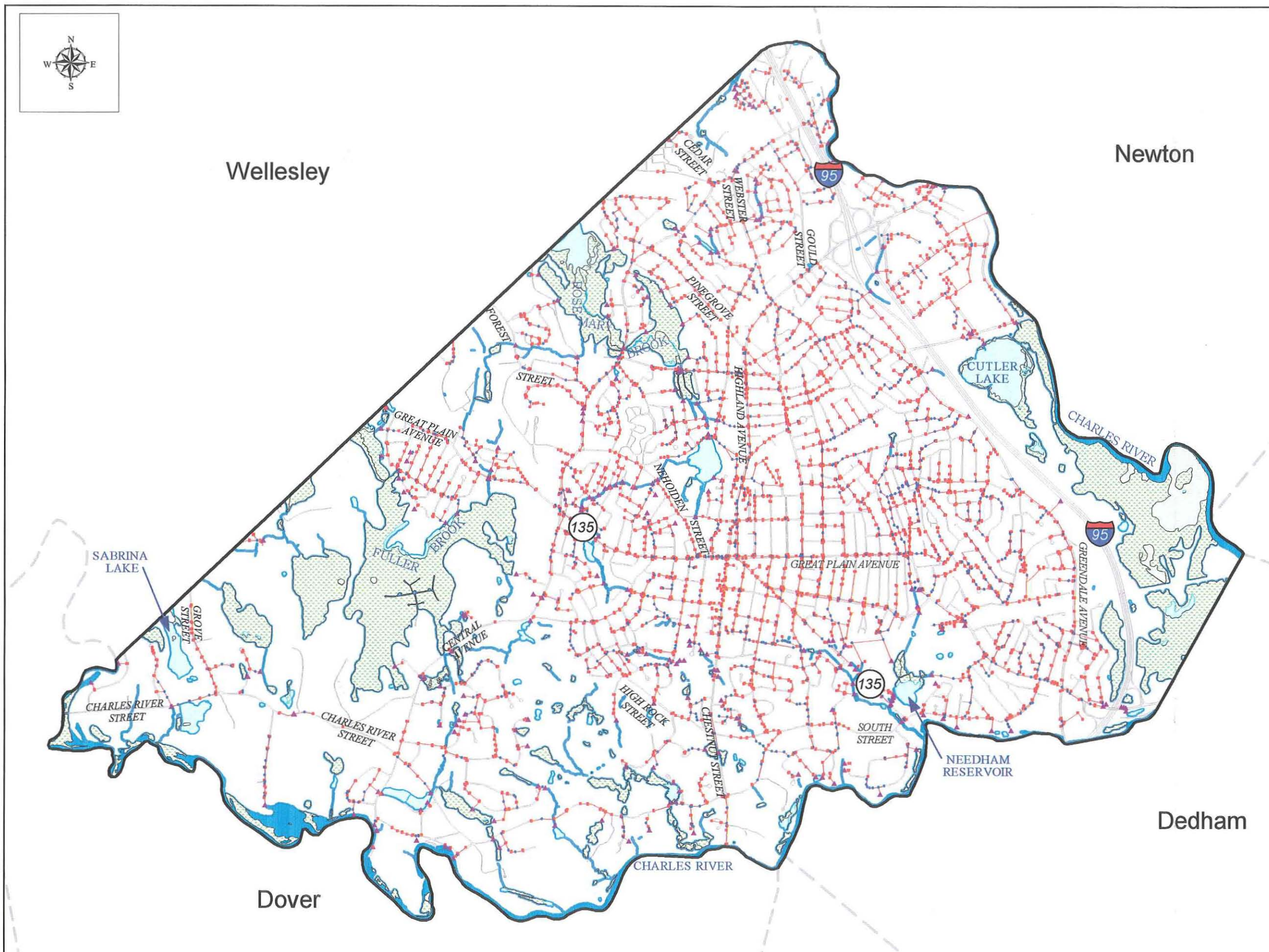
3.1 General

The Town of Needham has been subdivided into four major sub-watersheds all of which ultimately contribute to the Charles River Watershed. Needham's overall storm water collection system is composed of pipes, culverts, swales, ditches, detention basins, wetland areas, streams, lakes, ponds and rivers. A database has been established which contains Town-wide information for all of the drainage structures and conduits. An overall map of Needham's drainage system is provided in Figure 3-1. The Town has established priority areas for drainage improvements and modeled those systems. In addition, the Town has several GIS coverages including; buildings, pavement edges, parking lots, sidewalks, driveways, water bodies, two-foot contours, etc., which assist in determining storm water priority areas. As a result, Needham has a complete picture of its existing drainage system, sub-watersheds, and flooding problems.

3.2 Sub-Watershed Descriptions

The characteristics of the four major sub-watershed areas within the Town are depicted in Table 3-1 on the following page. Sub-watershed characteristics and locations are significant to the overall drainage system for the Town. The sub-watershed locations are illustrated in Figure 3-2.

Two of the major sub-watersheds discharge directly to the Charles River, while the other two discharge to the Charles River through the Town of Wellesley via tributary waters such as Fuller Brook and Rosemary Brook. The four areas vary significantly in size and land use characteristics.

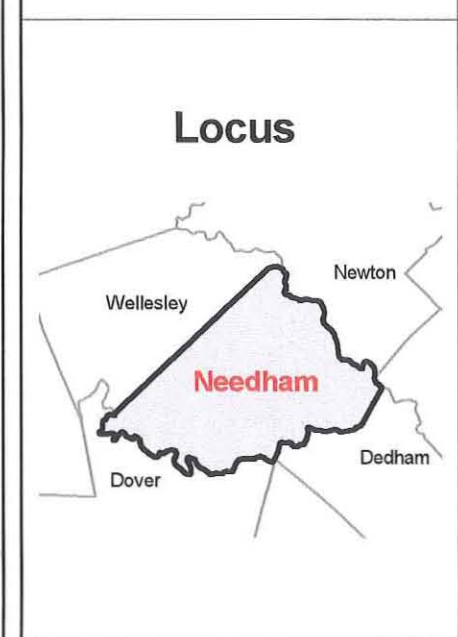


Legend

- Manholes
- Catch Basins
- ▲ Outfall Locations
- Pipes
- ▭ Lakes and Ponds
- ▭ Rivers
- ▭ Upland
- ▨ Wetland Areas
- Streams and Brooks

1250 0 1250 2500 Feet

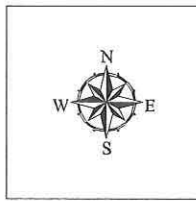
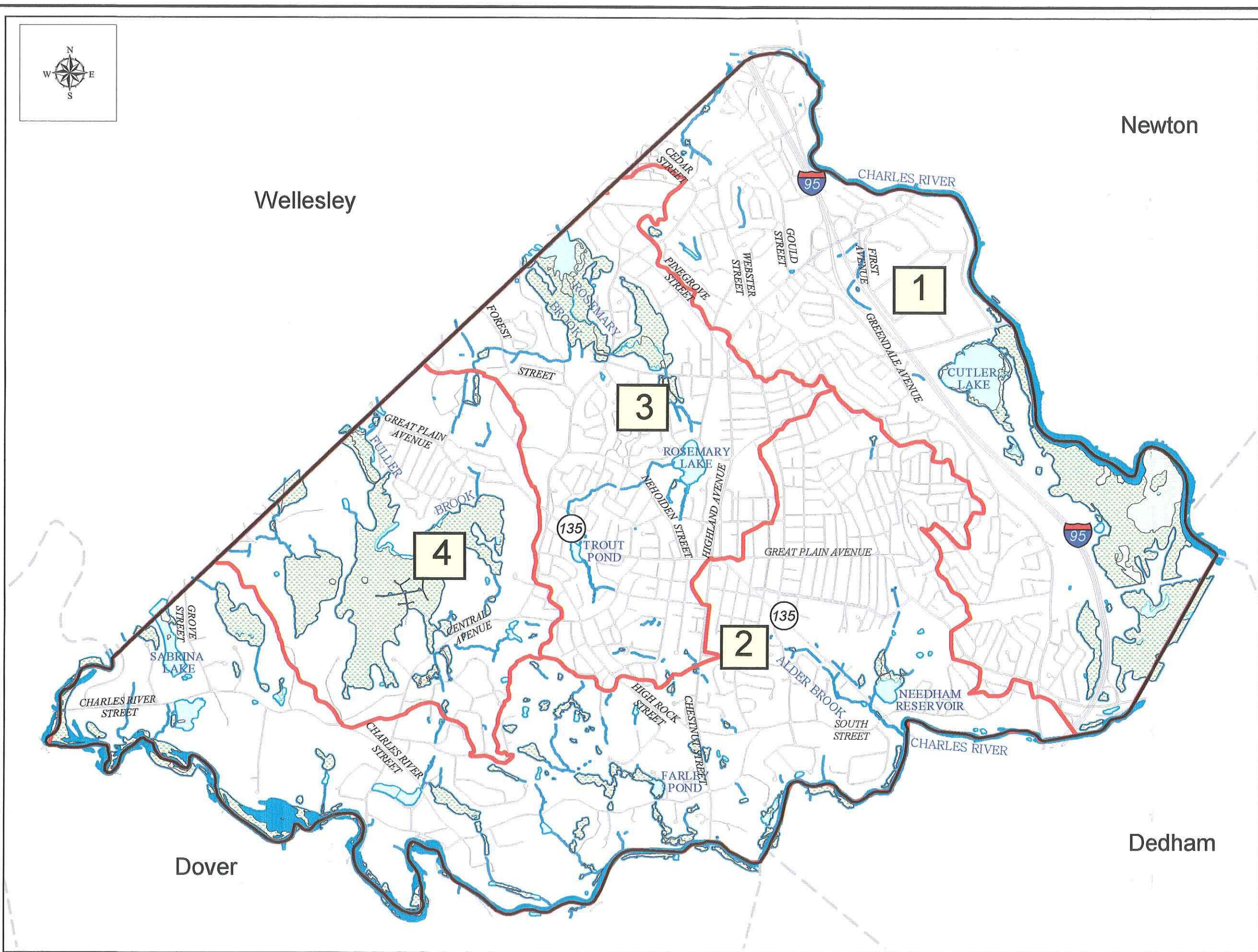
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Phase II Storm Water Management Plan
Needham, Massachusetts

Figure 3-1
Drainage System Map

Source: Town of Needham and MassGIS

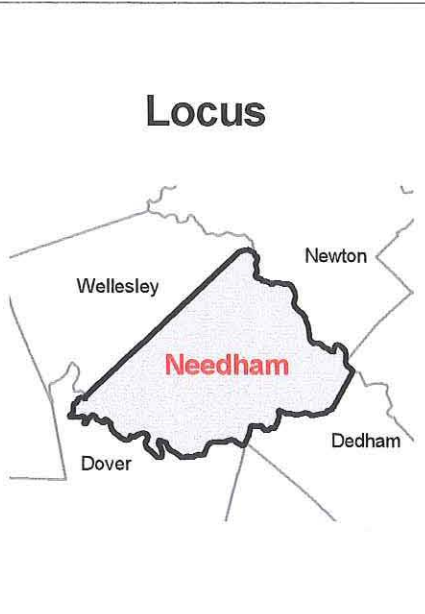


Legend

- Sub-Watershed Areas
- 1 Sub-Watershed No.
- Lakes and ponds
- Rivers
- Upland
- Wetland Areas
- Streams and Brooks

1250 0 1250 2500 Feet

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Phase II Storm Water Management Plan
Needham, Massachusetts

Figure 3-2

Sub-Watersheds

Source: Town of Needham and MassGIS

Table 3-1
Sub-Watershed Characteristics

Sub-Watershed	1	2	3	4
Location	Route 128	Southern	Interior A	Interior B
Area (acres)	2228	3123	1553	1257
Area (square miles)	3.5	5	2.5	2
Length of Pipe (miles)	29	37	30	6.5
Number of Catch Basins	1139	1475	1333	278
Number of Manholes	397	479	430	86
Number of Discharges	54	121	86	34

Sub-Watershed 1

Sub-watershed 1 is located along the Town’s eastern edge (formed by the Charles River) adjoining the City of Newton and to the east of Sub-watersheds 2 and 3. The area is bisected by the Route 128 corridor with a major (full clover leaf) interchange at Highland Avenue and a smaller interchange at Great Plain Avenue. The sub-watershed area is approximately 3.5 square miles and includes approximately 29 linear miles of pipe, 1,139 municipal catch basins, 397 drainage manholes, and 54 discharge points or outlets. The drainage systems within Sub-watershed 1 discharge to the State drainage system or directly to the Charles River.

The land use is predominantly single family residential with some forestland and a section of industrial land use. Major surface water bodies include the Charles River, Cutler Lake, and Hura Brook. The area also contains a large wetland located in the south-east corner between Route 128 and the Charles River.

Sub-Watershed 2

Sub-watershed 2 is located in the southern and central portion of Needham. The southern boundary is formed by the Charles River. The northern boundary is the southern limit of Sub-watersheds 3 and 4. Major transportation facilities and roadways include: the Commuter Rail Line, extending from the Town of Dover into Sub-watershed 1, Route 135, South Street, and Chestnut Street.

The sub-watershed is approximately 5 square miles and includes approximately 37 linear miles of pipe, 1,475 municipal catch basins, 479 drainage manholes, and approximately 121 discharge points or outlets. All discharges flow directly to the Charles River or ultimately flow to the River via wetland/stream systems.

The land use is predominantly single family and rural residential with some forestland and recreation areas. The area contains many surface water bodies including; the Charles River, Sabrina Lake, Needham Reservoir, Forbes, Walker and Farley Ponds, and Alder Brook. The area is also home to the Needham Golf Club, DeFazio Park, and a portion of the Ridge Hill Reservation.

Sub-Watershed 3

Sub-watershed 3 is located in central-northern section of Needham, with Wellesley to the north. Honeywell Street and Sub-watershed 2 are located along the eastern boundary and Sub-watersheds 2 and 4 form the southern and western boundaries, respectively.

The sub-watershed area is approximately 2.5 square miles and includes approximately 30 linear miles of pipe, 1,333 municipal catch basins, 430 drainage manholes, and 86 discharge points or outlets. All discharges flow to Rosemary Brook, through Wellesley and eventually to the Charles River.

The area has a variety of commercial, residential, and institutional uses. Needham Junction is located at the southern most point of the sub-watershed. Major surface water bodies in Sub-watershed 3 include Wellesley Water Works and Rosemary Lake, which are connected to Rosemary Brook. A major wetland area, bisected by Rosemary Brook, is also located in the vicinity of these water bodies. North Hill, the highest elevation in Town, is located in this sub-watershed.

Sub-Watershed 4

Sub-watershed 4 is located in western Needham bordering Wellesley, with Sub-watersheds 2 and 3 located south and east, respectively.

Sub-watershed 4 is approximately 2 square miles and includes approximately 6.5 linear miles of pipe, 278 municipal catch basins, 86 drainage manholes, and 34 discharge points or outlets. Discharges flow into wetland areas associated with Fuller Brook, through Wellesley and eventually to the Charles River.

The area in Sub-watershed 4 is characterized for forestland, wetland, and residential uses. The Ridge Hill Reservation and wetland areas comprise a large section of Sub-watershed 4. A majority of the development in this sub-watershed consists of a residential neighborhood located along Great Plain Avenue north of Fuller Brook. The Newman Junior High School, located on Central Avenue, is also located within this sub-watershed.

3.3 Drainage System Mapping

Utilizing Global Positioning System (GPS) technology, record plan information, aerial photography, and field inspections, the Town developed a comprehensive database for all town owned drainage structures and conduits.

Topographic map data was obtained from aerial photography completed in the spring of 1999 and compiled at a scale of 1"=40'. The base mapping was provided in ArcInfo format and consisted of numerous planimetric features including, but not limited to: infrastructure points, pavement edges, building footprints, water bodies, wetlands and 2-foot contours. Approximately 75% of the municipal drainage manholes and catch basins were located via photogrammetric methods, while the remaining 25% were located utilizing GPS or field survey.

There are 5,912 town owned structures in Needham's drainage system, including 4,225 catch basins, 1,392 drainage manholes, and 295 discharges. All of these structures are

included in a geographic information system (GIS) coverage with a connected database containing structure characteristics. It should be noted that outfall locations were determined and field inspected and are also included in the database. The drainage structure database contains the following information:

- Structure Type – Catch Basin, Manhole, Junction, Outfall, Headwall
- Street Name
- Record Plan Number
- Record Plan Date
- Record Plan Base Elevation
- Depth
- Rim Elevation
- Invert Elevations
- Notes and Comments – regarding any issues or assumptions in the database

The infrastructure points provided the framework for establishing the geographic location for drainage pipes using record plans provided by the Town. These plans contained plan and profile information that is critical to developing an accurate drainage system map and database. The conduit database includes the following information:

- Street Name
- Record Plan Number
- Record Plan Date
- Material
- Diameter or Dimensions
- Up Stream Invert
- Down Stream Invert
- Length
- Slope
- Notes and Comments – regarding any issues or assumptions in the database

The structure and pipe positions and databases are in GIS format and can be updated in the future to depict storm drain changes. This information allows the Town to track drainage system changes and prioritize areas of concern in the database.